



## **NASA STTR 2005 Phase I Solicitation**

### **T4.01 Earth Science Sensors and Instruments**

**Lead Center: GSFC**

As part of its mission, NASA seeks to develop a scientific understanding of the Earth system and its responses to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations. By using breakthrough technologies for terrestrial, airborne, and spaceborne instrumentation, we seek to observe, analyze, and model the Earth system to discover how it is changing and the consequences for life on Earth.

This subtopic is to solicit advanced remote sensing technologies to enable future Earth Science measurements.

#### **Active Remote Sensing Instruments (Lidar)**

Lidar remote sensing systems are required to meet the demanding measurement requirements for future Earth science missions. Instruments are solicited that enable or support the following Earth science measurements:

- High spatial and temporal resolution observations of the land surface and vegetation cover (biomass);
- Profiling of clouds and aerosols;
- Wind measurements (direct-detection technology only);
- Tropospheric and stratospheric ozone and CO<sub>2</sub> (profiling and total column); and
- Measurement of the air/sea interface and mixed layer.

Systems and approaches will be considered that demonstrate a capability that is scalable to space or can be mounted on a relevant platform (UAV, long-duration balloon, or aircraft). New systems and approaches are sought that will:

- Enable one of the Earth Science measurements listed above;
- Enhance an existing measurement capability by significantly improving the performance (spatial/temporal

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resolution, accuracy, range of regard); and/or

- Substantially reduce the resources (cost, mass, volume, or power) required to attain the same measurement capability.

### **Passive Remote Sensing Instruments for Unmanned Aerial Vehicles (UAVs)**

Spectral imaging devices for remote sensing onboard UAVs are also desired. In particular, uncooled infrared and thermal spectral imager instruments, with the following specifications, are solicited:

- Instrument must be less than 2 lbs and no larger than 0.05 m<sup>3</sup> in volume;
- Must operate autonomously in coordination with the onboard flight plan;
- Must have a built-in data acquisition system;
- Spectral bands must all be coregistered and the data must be GPS time tagged;
- Spectral bands should be centered at 3.75, 3.96, and 11 microns as well as a band in the visible at 0.6 microns; and
- Quantization bit resolution should be 10-bit minimum.

### **Microwave Measurements Using Large Aperture Systems**

New breakthrough technologies are sought for the construction of extremely large (tens of meters and larger diameter) microwave antenna systems. The microwave wavelengths will be determined according to the geophysical measurement of interest. Antenna concepts may include large single apertures or apertures composed of multiple elements that are operated synergistically to produce the desired performance. The proposed antenna systems must:

- Be compact upon launch, which can be achieved either through folding technologies or from some assemblage of small components into the larger final system in space;
- Achieve high precision surface form factors. Surface characteristics of the microwave antenna must be accurate enough to produce microwave beam patterns with adequately small side lobes; and
- Include beam-scanning capabilities. The beam scanning must be facile and over many beam widths so as to enable cross-track scanning if in LEO, or scanning over the full globe if at GEO. Beam widths must be small enough to resolve the few kilometer scales needed for many geophysical observations.